

RONALD PAUL HEDRICK
Department of Medicine and Epidemiology
School of Veterinary Medicine
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PERSONAL:

Citizenship: United States of America
Birthdate: 2 August 1950
Weight: 160 pounds
Marital Status: Wife, Karen Stevenson Hedrick
Two children, Ryan Paul and Brittany Lynne.

EDUCATIONAL EXPERIENCE:

Undergraduate Training:

B.S., Microbiology (1975) Oregon State University, Corvallis, OR
B.S., Biology (1976) University of Oregon, Eugene, OR

Graduate Training:

Ph.D., Microbiology (1980) Oregon State University, Corvallis, OR
Certified Fish Pathologist No. 25 (1985 - to present) American Fisheries Society, Fish Health Section

POSITIONS HELD:

Graduate Teaching Assistant, Department of Microbiology, Oregon State University. 1 October 1975 to 1 June 1977.

Graduate Research Assistant, Department of Microbiology, Oregon State University. 1 February 1980 to 1 January 1982.

Postdoctoral Fellowship, Department of Microbiology, Oregon State University, 1 February 1980 to 1 January 1982.

Assistant Professor, Assistant Aquaculturist, Department of Animal Science, Veterinary Medicine, Aquaculture Program, University of California, Davis. 1 January 1982 to 30 September 1984.

Assistant Professor, Assistant Aquaculturist, Department of Medicine, School of Veterinary Medicine, University of California, Davis, California. 1 October 1984 to 30 June 1987.

Associate Professor, Associate Aquaculturist, Department of Medicine, School of Veterinary Medicine, University of California, Davis, California. 1 July 1987 to present.

Professor, Aquaculturist, Department of Medicine, School of Veterinary Medicine, University of California, Davis, California. 1 July 1991 to present.

Chief, Fish Health Service, Veterinary Medicine Teaching Hospital, School of Veterinary Medicine, University of California. 1 July 1985 – present.

Adjunct, Graduate Faculty, Oregon State University, Corvallis, Oregon. 1988-1993.

Adjunct, Graduate - Grad. Studies, CiB, Programa de Estudios de Posgrado, Apdo. 128, La Paz, Baja California Sur, Mexico.

Visiting Scientist, Institut National de la Recherche Agronomique, Virologie et Immunologie Moleculaire, Jouy en Josas, France. 1 July 1990 - June 30, 1991.

Acting Director, Center for Aquatic Biology and Aquaculture, College of Agriculture and Environmental Sciences, University of California, Davis. May 1, 2001 - July 1, 2001.

Acting Chair, Department of Medicine and Epidemiology, School of Veterinary Medicine, University of California, Davis. July 20, 2001 - present.

PROFESSIONAL EXPERIENCE

Teaching:

Didactic: Professor for Aquatic Animal Medicine VM416. A 2.1 lecture and laboratory course for veterinary and aquaculture and fisheries students. Lectures and some laboratories given in VME 410 Captive Animal Management, VME 488 Nondomestic Pet Medicine, WFBC 121 Fish Physiology, VME 487 Comparative Form and Function, ANS 18 Introductory Aquaculture, ANS 118 Fish Production, ANS 136 Aquatic Animal Laboratory. Instructor for several fish disease courses/short courses including the Salmon Disease Workshop – Newport, Oregon 1 – 2 days lectures/laboratories for graduate veterinarians and fisheries biologists. Other international courses in Chile, Korea, Thailand, Taiwan, Mexico and U.S.A. Served as a teaching assistant for two years in a graduate medical microbiology sequence. Duties included sole responsibility for preparing and teaching the laboratories for pathogenic microbiology, immunology and virology. Student enrollment in these laboratories was between 15-30 per course.

Clinical: Oversee VMD 470 Fish Health with 50 – 60 students per year. Supervise students in the senior rotations through Fish Health Service (approximately 3 – 5 students per year with 2 – 12 week rotations). Supervise and mentor to 1 – 2 residents per year in the Fish Health Service and 1 – 2 Laboratory Animal residents with 1 – 2 week rotations. Coordinate Fish Health Pathology rounds 2 hrs per week, held at the Aquatic Center with 2 – 3 residents (Fish Health, Zoomed, Lab Animal) and other pathologists (CVDLS).

Committees/Offices/Editorial Boards:

Coeditor, Journal of Aquatic Animal Health, American Fisheries Society (1996 – present).
Editorial Board/Associate Editor - Journal of Aquatic Animal Health (1993 – 1995).
Advisory Editor for Diseases of Aquatic Organisms (1990 – present).
Member Fish Aquaculture Disease Committee, an advisory panel to Director of California Department of Fish and Game. 1982-present.
Member Technical Committee, Western Regional Aquaculture Committee (1994 - 1996)
Member California Sea Grant Committee (1999 - 2000)
Member of the Davis Division Committee on Committees (2000-2002)
Member of the Department of Medicine and Epidemiology Research Committee. (Currently)
Member of the MPVM Admissions and Student Affairs Committee (1999 - present)
Member of the Research Council School of Veterinary Medicine (2000 - present)
Member of the Executive Committee of the Center for Aquatic Biology and Aquaculture (1996 - present)
Member of Executive Committee of School of Veterinary Medicine (1993 - 1996)
Chair of the Faculty School of Veterinary Medicine (1995 - 1996)
Member Academic Council School of Veterinary Medicine (1995 - 1996)
Member International Programs Committee, School of Veterinary Medicine (Currently 1992 - 1994)
Admissions Committee - School of Veterinary Medicine (1990 - 1991 and 1992-1993)
Member of Research Committee, School of Veterinary Medicine (1993 - 1995)
Member of the Executive Committee of the Comparative Pathology Graduate Group (1987-1988) and 2000 - present.

Chair and Member of the International Programs Committee (1997 – 1999)
 Member of the Publications Committee, Fish Health Section, American Fisheries Society (1996 - present).
 Member of Awards Committee, Fish Health Section/American Fisheries Society (1986-1989, 1999-2001)
 Member of International Committee for Nomenclature of Viruses from Lower Vertebrates (Currently)
 President, Fish Health Section/American Fisheries Society (1988)
 Immediate Past President, Fish Health Section, American Fisheries Society, 1988-1989
 Chair Long Range Planning Committee, American Fisheries Society, Fish Health Section (1990 - 1991)
 U.S.A. Branch Officer of the European Association of Fish Pathologists, EAFP
 (1988 - present)
 Chair, Office of International Epizootics Subcommittee on Iridoviruses (1998 – 1999)
 Chair, Fish Health Legislation/Regulation Committee EAFP - (Currently)
 Co-chair, International Symposium on Aquatic Animal Health, Sept. 4-8, 1994 (500 attendees).
 Scientific Program Chair, Whirling Disease Symposium, Feb 21 – 23, 1997 (300 attendees).

HONORARY AND PROFESSIONAL SOCIETIES:

Honorary Membership, American Fisheries Society 1999
 Outstanding Young Men of America, 1983
 Sigma Xi, Scientific Research Society, Oregon State University Chapter
 American Men of Science
 American Fisheries Society/Fish Health Section, President 1988, Coeditor (currently)
 Japanese Society of Fish Pathology
 European Association of Fish Pathologists, U.S. Branch Official 1988 - present

EDITORIAL BOARDS AND JOURNAL REVIEWS

Co-Editor, Journal of Aquatic Animal Health 1996 - present
 Editorial Board, Diseases of Aquatic Organisms 1990 - present
 Editorial Board, International Journal of Recirculating Aquaculture 1998 - present
 Reviewer for Journal of Aquatic Animal Health, Diseases of Aquatic Organisms, Aquaculture, Fish Biology, Aquaculture Engineering, Journal of Eukaryotic Microbiology, Journal of Parasitology, Virology Archives, Acta Protozoologica, Aquatic Toxicology, Fish Pathology, Protozoologica, Journal of Virological Methods, Vaccine, Comparative Immunology, Microbiology and Infectious Diseases. Approximately 70 manuscripts are reviewed per year outside of my editorial duties with the Journal of Aquatic Animal Health.

RESEARCH AWARDS:

Beecham Award for Excellence in Research 1986
 American Fisheries Society, Best Journal Papers for 1994, 1999
 Achievement Award, Fish Health Section, American Fisheries Society, 1995
 Snowdon Lecturer, CISRO, Australian Animal Health Laboratory, 1996
 S.F. Snieszko Distinguished Service Award, American Fisheries Society, Fish Health Section, 1998
 American Fisheries Society – Honorary Lifetime Member 1999

PATENTS

U.S. Patent No. 5,962,227, Issued October 5, 1999, “DNA –based diagnostic test for detecting Myxobolus, the cause of salmonid whirling disease” UC Case No. 96-263-2.

PUBLICATIONS
Ronald P. Hedrick, PhD

1. 1978 Hedrick, R.P., Leong, J.C. and Fryer J.L.: Persistent infections in salmonid fish cells with infectious pancreatic necrosis virus (IPNV). *Journal Fish Diseases* 1:297-308.
2. 1981 Hedrick, R.P. and Fryer, J.L.: Persistent infection of three salmonid cell lines with infectious pancreatic necrosis virus (IPNV). *Fish Pathology* 15:163-172.
3. 1982 Hedrick, R.P. and Fryer, J.L.: Persistent infections of salmonid cell lines with infectious pancreatic necrosis virus (IPNV): A model for the carrier state in trout. *Fish Pathology* 16:163-172.
4. 1983 Okamoto, N., Hedrick, R.P., Fryer, J.L. and Sano, T.: Antigenic relationship of 10 strains of infectious pancreatic necrosis virus (IPNV) and eel virus european (EVE). *Journal Fish Diseases* 6:19-25.
5. 1983 Hedrick, R.P., Okamoto, N., Sano, T. and Fryer, J.L.: Biochemical characteristics of eel virus european (EVE). *Journal of General Virology* 64:1421-1426.
6. 1983 Hedrick, R.P. and Okamoto, N.: Biochemical and antigenic characteristics of eel virus European compared to selected strains of infectious pancreatic necrosis virus. *Double-Stranded RNA Viruses*. Ed. By R.W. Compans and D.H.L. Bishop. Elsevier Biomedical.
7. 1983 Hedrick, R.P., Fryer, J.L., Chen, S.N. and Kou, G.H.: Characteristics of four birnaviruses isolated from fish in Taiwan. *Fish Pathology* 18:91-97.
8. 1984 Amend, D.F., McDowell, T., and Hedrick, R.P.: Characteristics of a previously unidentified virus from channel catfish (*Ictalurus punctatus*). *Canadian Journal of Fisheries and Aquatic Sciences* 41:807-811.
9. 1984 Hedrick, R.P., Rosemark, R., Aronstein, D., Winton, J.R., McDowell, T. and Amend, D.F.: Characteristics of a new reovirus from channel catfish (*Ictalurus punctatus*). *Journal General Virology* 65:1527-1534.
10. 1984 Hedrick, R.P., Kent, M.L., Rosemark, R. and Manzer, D.: Occurrence of proliferative kidney disease (PKD) among Pacific salmon and steelhead trout. *Bulletin of the European Association of Fish Pathologists* 4(3):34-37.
11. 1984 Hedrick, R.P., Kent, M.L., Rosemark, R. and Manzer, D.: Proliferative kidney disease (PKD) of Pacific salmon. *Journal of the World Mariculture Society* 15:318-325.

12. 1984 Ueno, Y., Chen, S.N., Kou, G.H., Hedrick, R.P. and Fryer, J.L.: Characterization of a virus isolated from Japanese eels (Anguilla japonica) with nephroblastoma. Bulletin of the Institute of Zoology, Academia Sinica 23:47-55.
13. 1985 Hedrick, R.P., Speas, J., Kent, M.C., and McDowell, T.: Adenovirus-like particles associated with a disease of cultured white sturgeon, Acipenser transmontanus. Canadian Journal of Fisheries and Aquatic Sciences 42:1321-1325.
14. 1985 Kent, M.L. and Hedrick, R.P.: PKX, the causative agent of proliferative kidney disease (PKD) of salmonid fish and its affinities with the Myxozoa. Journal of Protozoology 32:254-260.
15. 1985 Chen, S.N., Kou, G.H., Hedrick, R.P. and Fryer, J.L.: The occurrence of viral infections of fish in Taiwan. In Fish and Shellfish Pathology. Ed. A.E. Ellis, Academic Press, London, pp 313-319.
16. 1985 Hedrick, R.P., Kent, M.L., Foott, J.S., Rosemark, R. and Manzer, D.: Proliferative kidney disease (PKD) among salmonid fish in California, USA; a second look. Bulletin of the European Association of Fish Pathologists 5:36-38.
17. 1985 Kent, M.L. and Hedrick, R.P.: Transmission of the causative agent of proliferative kidney disease (PKD) with the blood and spleen of infected fish; further evidence that the PKX parasite belongs to the phylum myxozoa. Bulletin of the European Association of Fish Pathologists 5:39-42.
18. 1985 Hedrick, R.P., Eaton, W.D., Fryer, J.L., Hah, Y.C., Park, J.W. and Hong, S.W.: Biochemical and serological properties of birnaviruses isolated from fish in Korea. Fish Pathology 20:463-468.
19. 1985 Kent, M.L. and Hedrick, R.P.: The biology and associated pathology of Goussia carpelli (Leger and Stankovitch) in goldfish Carassius auratus (Linnaeus). Fish Pathology 20:485-494.
20. 1986 Hedrick, R.P., McDowell, T., Rosemark, R., Aronstein, D. and Chan, L. A comparison of four apparatuses for tissue dispersion in recovering infectious pancreatic necrosis virus from carrier rainbow trout. The Progressive Fish-Culturist 46:47-51.
21. 1986 Hedrick, R.P., McDowell, T., Eaton, W.D., Chan, L. and Wingfield, W. Herpesvirus salmonis (HPV): First occurrence in anadromous salmonids. Bulletin of the European Association of Fish Pathologists 6(3):66-67.

22. 1986 Hedrick, R.P. and McDowell, T. Mortalities among striped bass (Morone saxatilis) caused by Mycobacterium marinum. Bulletin of the European Association of Fish Pathologists 6(3):64-65.
23. 1986 Hedrick, R.P., Kent, M.L. and Toth, R.J. Myxosporeans detected in non-salmonid fishes from waters enzootic for proliferative kidney disease. Bulletin of the European Association of Fish Pathologists 6(2):32-35.
24. 1986 Duhamel, G.E., Kent, M.L., Dybdal, N.O. and Hedrick, R.P. Henneyguia exilis Kudo associated with granulomatous branchitis of channel catfish Ictalurus punctatus (Rafinesque). Veterinary Pathology 3:354-361.
25. 1986 Hedrick, R.P., Fryer, J.L., Groberg, W.J., Eaton, W.D. and Boonyaratpalin, S.: Characteristics of a birnavirus isolated from cultured sand goby (Oxyeleotris marmoratus). Diseases of Aquatic Organisms, 1:219-225.
26. 1986 Kent, M.L. and Hedrick, R.P.: The development of the PKX myxosporean in rainbow trout, Salmo gairdneri Richardson. Diseases of Aquatic Organisms, 1:169-182.
27. 1986 Hedrick, R.P., Kent, M.L. and Smith, C.E.: Proliferative kidney disease among salmonid fishes. Fish Disease Leaflet No. 74. United States Department of Interior. Fish and Wildlife Service, Washington, D.C., p. 1-9.
28. 1986 Foott, J.S., Rosemark, R. and Hedrick, R.P.: Seasonal occurrence of the infectious stage of proliferative kidney disease (PKD) in California. Bulletin of the European Association of Fish Pathologists 6(4):9-11.
29. 1987 Winton, J.R., Lannan, C.N., Fryer, J.L., Hedrick, R.P., Meyers, T.R. and Plumb, J.A.: Morphological and biochemical properties of four members of a novel group of reoviruses isolated from aquatic animals. Journal of General Virology 68:353-364.
30. 1987 Kent, M.L., Duhamel, G.E., Foott, J.S. and Hedrick, R.P.: Chronic branchitis (Hamburger Gill Disease) of channel catfish in California and it's possible myxosporean etiology. California Fish and Game 73(2):99-105.
31. 1987 Foott, J.S. and Hedrick, R.P.: Seasonal occurrence of the infectious stage of proliferative kidney disease (PKD) and resistance of rainbow trout Salmo gairdneri Richardson, to reinfection. Journal of Fish Biology 30:477-483.
32. 1987 Kent, M.L. and Hedrick, R.P.: Effects of cortisol implants on the PKX myxosporean causing proliferative kidney disease in rainbow trout Salmo gairdneri. Journal of Parasitology 73(3):455-461.

33. 1987 Hedrick, R.P., Groff, J.M. and McDowell, T.: Mycobacteriosis in striped bass from California. *Journal of Wildlife Diseases* 23(3):391-395.
34. 1987 Hedrick, R.P., McDowell, T., Eaton, W.D., Kimura, T. and Sano, T.: Serological relationships of five herpesviruses isolated from salmonid fishes. *Journal of Applied Ichthyology* 3:87-92.
35. 1987 Elston, R.A., Beattie, J.H., Kent, M.L., Friedman, C., Hedrick, R.P. and Kent, M.L.: Pathology and significance of fatal inflammatory bacteremia in the Pacific oyster, Crassostrea gigas Thunberg. *Journal of Fish Diseases* 10:121-132.
36. 1987 Hedrick R.P. and McDowell, T.: Passive transfer of sera with antiviral neutralizing activity from adult channel catfish protects juveniles from channel catfish virus disease. *Transactions American Fisheries Society* 116:277-281.
37. 1987 Hedrick, R.P., Groff, J.M. and McDowell, T.: Response of adult channel catfish to water-borne exposures to channel catfish virus. *The Progressive Fish Culturist* 49:181-187.
38. 1987 Lightner, D.V., Hedrick, R.P., Fryer J.L., Chen, S.N., Liao, T. and Kou, G.H.: A survey of cultured penaeid shrimp in Taiwan for viral and other important diseases. *Fish Pathology* 22(3):127-140.
39. 1987 Hedrick, R.P., Kent, M.L., Toth, R.J. and Morrison, J.K.: Fish infected with Spaerospora spp. Thelohan (Myxosporea) from waters enzootic for proliferative kidney disease of salmonids. *Journal of Protozoology* 35 (1):13-18.
40. 1987 Lightner, D.V., and Hedrick, R.P.: Embryonal carcinoma in developing embryos of the grass shrimp, Palaemon orientis, (CRUSTACEA: DECAPODA). *Diseases of Aquatic Organisms* 2(4):6-12.
41. 1987 Hedrick, R.P. and Aronstien, D.: Effects of saltwater on the progress of proliferative kidney disease (PKD) in chinook salmon (Oncorhynchus tshawytscha). *Bulletin European Association of Fish Pathol.* 7:93-96.
42. 1987 Hedrick, R.P., LaPatra, S.E., Fryer, J.L., McDowell, T. and Wingfield, W.H.: Susceptibility of coho (Oncorhynchus kisutch) and chinook (Oncorhynchus tshawytscha) salmon Hybrids to experimental infections with infectious hematopoietic necrosis virus (IHNV). *European Association of Fish Pathol.* 7:97-100.

43. 1988 Hedrick, R.P., Groff, J.M., Foley, P. and McDowell, T.: Oral administration of Fumagillin DCH protects chinook salmon (Oncorhynchus tshawytsch) from experimentally-induced proliferative kidney disease. *Disease of Aquatic Organisms* (4):165-168.
44. 1988 Fryer, J.L., Hedrick, R.P., Park, J.W. and Hah, Y.C.: Isolation of Aeromonas salmonicida from masu salmon in the Republic of Korea. *Journal of Wildlife Disease* 24:364-365.
45. 1988 Kent, M.L., Sawyer, T.K. and Hedrick, R.P.: Paramoeba pemaquidensis (Sacromastigophora: Paramoebidae) infestation of the gills of coho salmon (Oncorhynchus kisuth) reared in sea water. *Diseases of Aquatic Organisms* 5:163-169.
46. 1988 Boon, J.H., McDowell, T. and Hedrick, R.P.: Resistance of the African (Clarias gariepinus) and the Asian catfish (Clarias batrachus) to channel catfish virus. *Aquaculture* 75:191-194.
47. 1989 Lauren, D.J., Wishkovsky, A., Groff, J.M., Hedrick, R.P. and Hinton, D.E.: Toxicity and pharmacokinetics of the antibiotic fumagillin in yearling rainbow trout (Salmo gairdneri). *Toxicology and Applied Pharmacology* 98:444-453.
48. 1989 Friedman, C.S., McDowell, T., Groff, J.M., Hollibaugh, J.T., Manzer, D. and Hedrick, R.P.: Presence of Bonamia ostreae among populations of the European flat oyster, Ostrea edulis Linne, in California, USA. *Journal of Shellfish Research* 8(1):133-137.
49. 1989 Arkush, K.D., Bovo, G., DeKinkelin, P., Winton, J.R., Wingfield, W.H. and Hedrick, R.P.: Biochemical and antigenic properties of the first isolates of infectious hematopoietic necrosis virus from salmonid fish in Europe. *Journal of Aquatic Animal Health* 1:148-153.
50. 1989 MacConnell, E.M., Smith, C.E. and Hedrick, R.P.: The cellular inflammatory response of rainbow trout to PKX. *Journal of Aquatic Animal Health* 1(2):108-118.
51. 1989 Kent, M.L., Elliott, D.G., Groff, J.M. and Hedrick, R.P.: Loma salmonae (Protozoa: Microspora) infections in seawater reared coho salmon Oncorhynchus kisutch. *Aquaculture* 80:211-222.
52. 1989 Eaton, W.D., Wingfield, W.H. and Hedrick, R.P.: Prevalence and experimental pathogenesis of the steelhead herpesvirus in salmonid fishes. *Diseases of Aquatic Organisms* 7:23-30.
53. 1989 Hedrick, R.P., Friedman, C.S. and Modin, J.: Systemic infection in Atlantic salmon Salmo salar with a Dermocystidium-like species. *Diseases of Aquatic Organisms* 7:171-177.
54. 1989 Hedrick, R.P., Groff, J.M., McDowell, T., and Wingfield, W.H.: Characteristics of reoviruses isolated from cyprinid fishes in California. *IN: Viruses of Lower Vertebrates*. W. Anne and E. Kurstak (eds.), Springer-Verlag, Berlin, pp. 241-249.
55. 1989 Hedrick, R.P. and Sano, T.: Herpesviruses of Fishes. *IN: Viruses of Lower Vertebrates*. W. Anne and E. Kurstak, (eds.), Springer-Verlag, Berlin, pp. 161-170.
56. 1990 LaPatra, S.E., Fryer, J.L., Wingfield, W.H. and Hedrick, R.P.: Infectious Hematopoietic Necrosis Virus (IHNV) in Coho salmon (Oncorhynchus kisutch). *Journal of Aquatic Animal Health* 1:277-280.
57. 1990 LaPatra, S.E., Groff, J.M., Fryer, J.L., Hedrick, R.P.: Comparative pathogenesis of three strains of infectious hematopoietic necrosis virus in rainbow trout (Oncorhynchus mykiss). *Disease of Aquatic Organisms* 8:105-112.
58. 1990 Baxa, D. and Hedrick, R.P.: Susceptibility of salmonid species to experimental infections with

Edwardsiella ictaluri. Diseases of Aquatic Organisms 8:113-117.

59. 1990 Foott, J.S. and Hedrick, R.P.: Blood parameters and immune status of rainbow trout (Salmo gairdneri) with proliferative kidney disease. Journal of Aquatic Animal Health 2:141-148.
60. 1990 Hedrick, R.P., McDowell, T. and Groff, J.M.: Sphaerospora ictaluri n. sp. (Myxosporea: Sphaerosporidae) observed in the kidney of channel catfish, Ictalurus punctatus Rafinesque. J. Protozoology 37(2):107-112.
61. 1990 Hedrick, R.P., Groff, J.M., McDowell, T., and Wingfield, W.H.: An iridovirus infection of the integument of white sturgeon (Acipenser transmontanus). Diseases of Aquatic Organisms 8:39-44.
62. 1990 Hedrick, R.P., T. McDowell and J.M. Groff. Virus-like particles in erythrocytes of coho salmon (Oncorhynchus kisutch). Aquaculture 89:377-381.
63. 1990 Wiskovsky, A., Groff, J.M., Lauren, D.L., Toth, R.J. and Hedrick, R.P. Efficacy of fumagillin against proliferative kidney disease and its toxic side effects in rainbow trout (Oncorhynchus mykiss) fingerlings. Fish Pathology 25:141-146.

64. 1990 Hedrick, R.P., Groff, J.M. and McDowell, T.S. Hematopoietic intranuclear microsporidian infections with features of leukemia in chinook salmon (Oncorhynchus tshawytscha). Diseases of Aquatic Organisms 8:189-197.
65. 1990 Dominguez, J., Hedrick, R.P. and Sanchez-Vizcaino, J.M. Use of monoclonal antibodies for detections of infectious pancreatic necrosis virus by the enzyme-linked immunosorbent assay (ELISA). Diseases of Aquatic Organisms 8:157-163.
66. 1990 Hedrick, R.P., Groff, J.M. and McDowell, T.S. Gill sphaerosporosis in goldfish (Carassius auratus). Journal of Wildlife Diseases 26(4):558-560.
67. 1990 Hedrick, R.P., Groff, J.M., Okihiro, M.S. and McDowell, T.S. Herpesviruses detected in papillomatous skin growths of koi carp (Cyprinus carpio). Journal of Wildlife Diseases 26(4):578-581.
68. 1990 Hedrick, R.P., McDowell, T., Kent, M.L. and Elston, R.A.: A small RNA virus isolated from Atlantic salmon (Salmo salar). J. Applied Ichthyology 6:173-181.
69. 1990 Hedrick, R.P., Amandi, A. and Manzer, D. Nanophyetus salmincola, the trematode vector of Neorickettsia helminthoeca. California Veterinarian, July/August pp. 18-22.
70. 1990 Arkush, K.D. and Hedrick, R.P. Experimental transmission of PKX, the causative agent of proliferative kidney disease, to three species of Pacific salmon. Applied Ichthyology 6:237-243.
71. 1990 Ibarra, A., Gall, G.A.E. and R.P. Hedrick. Trials with fumagillin DCH and malachite green to control Ceratomyxosis in rainbow trout (Oncorhynchus mykiss). Fish Pathology 25(4):217-223.
72. 1991 Friedman, C.S., J.H. Beattie, R.A. Elston and Hedrick, R.P.: Investigation of the relationship between the presence of a gram-positive bacterial infection and summer mortality of the Pacific oyster, Crassostrea gigas Thunberg. Aquaculture 94:1-15.
73. 1991 Dominguez, J, M. Babin, C. Sanchez and R.P. Hedrick: Rapid serotyping of infectious pancreatic necrosis virus by one-step enzyme-linked immunosorbent assay using monoclonal antibodies. Journal of Virological Methods 31:93-104.
74. 1991 Hedrick, R.P., Yun, S. and Wingfield, W.H.: A small RNA virus isolated from salmonid fishes in California, USA. Canadian Journal of Fisheries and Aquatic Sciences 48:99-104.

75. 1991 Hedrick, R.P., Wishkovsky, A., Modin, J.C. and Toth, R.J.: Three myxosporeans found in the cranial and branchial tissues of rainbow trout (Oncorhynchus mykiss) in California, U.S.A. Journal of Aquatic Animal Health 3:55-62.
76. 1991 de Kinkelin, P. and R.P. Hedrick: Dilemmas of disease control policies. Bulletin European Association of Fish Pathologists.
77. 1991 Friedman, C.S. and Hedrick, R.P.: Pacific oyster nocardiosis: isolation of the bacterium and induction of laboratory infections. Journal of Invertebrate Pathology 57:109-120.
78. 1991 Groff, J.M., Hedrick, R.P., McDowell, T., Kent, M.L. and Mughaman, A.: An epizootic of cutaneous zygomycosis in cultured dwarf African clawed frogs (Hymenochirus curtipes) due to Basidiobolus ranarum. Journal of Veterinary and Medical Mycology 29:215-233.
79. 1991 Hedrick, R.P., McDowell, T., Rosemark, R., Aronstein, D. and Lannan, C.N.: Two cell lines from white sturgeon (Acipenser transmontanus). Transactions American Fisheries Society 120:528-534.
80. 1991 Chilmonczyk, S., Cox, W.T. and R.P. Hedrick: Enterocytozoon salmonis n.s.: An intranuclear microsporidian from salmonid fish. J. Protozoology 38:264-269.
81. 1991 de Kinkelin, P. and R.P. Hedrick: Veterinary regulations for the movements of fish and fish eggs. Annual Reviews of Fish Diseases 1:27-40.
82. 1991 Hedrick, R.P., Groff, J.M. and D. Baxa: Experimental transmission and progress of Enterocytozoon salmonis infections in chinook salmon (Oncorhynchus tshawytscha). Diseases of Aquatic Organisms 10:103-108.
83. 1991 Castagnaro, M., M. Marin, C. Ghittino and R.P. Hedrick: Lectin histochemistry and ultrastructure of rainbow trout Oncorhynchus mykiss kidneys affected by proliferative kidney disease. Diseases of Aquatic Organisms 10:173-183.
84. 1991 Ibarra, A.M., G.A.E. Gall and R.P. Hedrick: Susceptibility of two strains of rainbow trout (Oncorhynchus mykiss) to experimentally-induced infections with the myxosporean Caratomyxa shasta. Diseases of Aquatic Organisms 10:191-194.
85. 1991 Hedrick, R.P., Groff, J.M. and T.S. McDowell: Isolation of an epitheliotropic herpesvirus from white sturgeon (Acipenser transmontanus). Diseases of Aquatic Organisms 11:49-56.

86. 1991 Friedman, C.F., D. Manzer and R.P. Hedrick: A haplosporidian from Pacific oysters (Crassostrea gigas). *Journal of Invertebrate Pathology* 58:367-372.
87. 1991 Eaton, W.D., Wingfield, W.H. and Hedrick, R.P.: Comparison of the DNA homologies of five salmonid herpesviruses. *Fish Pathol.* 26:183-187.
88. 1992 Arkush, K.D., McNeil, C. and R.P. Hedrick: Production and initial characterization of monoclonal antibodies to channel catfish virus, the causative agent of channel catfish virus disease. *J. Aquatic Animal Health* 4:81-89.
89. 1992 Hedrick, R.P., Marin, M., Castagnaro, M. and de Kinkelin, P.: A rapid based lectin stain for the myxosporean causing proliferative kidney disease in salmonid fish. *Dis. Aquat. Org.* 13:129-132.
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* = publication included in the dossier

x = most significant works

+ = student/resident/postdoctoral trainee where faculty member played major mentoring role

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* = publication included in the dossier

x = most significant works

+ = student/resident/postdoctoral trainee where faculty member played major mentoring role

ABSTRACTS
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73. 1994 Wongtavatchai, J. and Hedrick, R.P.: Effects of parasitism with Enterocytozoon salmonis on salmonid leucocyte functions. Paper. Western Fish Disease Workshop. Bozeman, Montana, June 22 - 25.
74. 1995 Hedrick, R.P., Barlough, J.E. and McDowell, T.S.: Microsporidian pathogens of fish: Recent developments and molecular approaches. Invited Keynote Speaker. Fourth International Symposium of Ichthyoparasitology, Munich Germany, October 3 - 7.
75. 1993 Andree, K. and Hedrick, R.P.: Comparison of SSU rRNA genes of alternate stages of the myxosporean Myxobolus cerebralis. Paper. European Association of Fish Pathologists, Munich, Germany, October 3 - 7.
76. 1993 Andree, K. and Hedrick, R.P.: Comparison of SSU rRNA genes of alternate stages of the myxosporean Myxobolus cerebralis. Paper. European Association of Fish Pathologists, Brest, France, September 5 - 10, (same as given in Germany).
77. 1995 Hedrick, R.P.: Fish Health Legislation in the United States - Title 50 Revision: Assessment after 3 Years. Invited Panel Speaker. European Association of Fish Pathologists, Mallorca, Spain, September 10 - 15.
78. 1995 Hedrick, R.P., Antonio, D., McDowell, T.: Understanding the causes of bacterial ulcerative diseases in koi. Invited Lecture. Annual Meeting of the American Koi Club Associations. Hyatt Hotel, San Jose, California, June 23 - 24.
79. 1995 Hedrick, R.P.: The movements of pathogens with the international trade of live fish: Problems and solutions. Invited Speaker. International Conference on Preventing the Spread of Aquatic Animal Diseases through International Trade. O.I.E. Paris, France, June 7 - 9.

80. 1995 Hedrick, R.P., Barlough, J.E. and McDowell, T.S.: Properties of iridoviruses from ornamental fish. Invited Speaker. Third International Symposium on Viruses of Lower Vertebrates. INRA, Jouy-en-Josas, France, March 15 - 17.
81. 1997 Beauchamp, K.A., McDowell, T.S., Mukkatira, K., Signarowitz, B., Hedrick, R.P.: Molecular approaches to identification of the alternate oligochaete host of *Myxobolus cerebralis*, and effects of temperature on survival of the host and parasite release. International Symposium on Aquatic Oligochaetes, Presque Isle, Maine. August 18-22.
82. 1998 Adkison, M.A., Marty, G.D. and Hedrick, R.P.: Development of humoral immunity and influence of passive immunity to whirling disease. Whirling Disease Symposium: Research in Progress, Fort Collins, CO. Feb. 19-21, pp. 99-101.
83. 1998 Antonio, D.B., McDowell, T.S., Marty, G.D., MacConnell, E. and Hedrick, R.P.: Application of *in situ* hybridization protocol to evaluate the progress of infection in fish and oligochaetes resistant to *Myxobolus cerebralis*. Whirling Disease Symposium: Research in Progress, Fort Collins, CO. Feb. 19-21, pp. 103-104.
84. 1998 El-Matbouli, M., McDowell, T., Mukkatira, K. and Hedrick, R.P.: Susceptibility of two different populations of tubificids to *Myxobolus cerebralis*. Whirling Disease Symposium: Research in Progress, Fort Collins, CO. Feb. 19-21, pp. 117-119.
85. 1998 El-Matbouli, M., McDowell, T.S. and Hedrick, R.P.: Effect of temperature on the development of the triactinomyxon stage of *Myxobolus cerebralis* in the intestine of *Tubifex tubifex*: light and electron microscopic observations. Whirling Disease Symposium: Research in Progress, Fort Collins, CO. Feb. 19-21, pp. 127-129.
86. 1998 Kathman, D., Hedrick, R.P. and Beauchamp, K.A.: Will the real *Tubifex tubifex* please stand up? Whirling Disease Symposium: Research in Progress, Fort Collins, CO. Feb. 19-21, pp. 131-132.
87. 1998 Beauchamp, K.A., McDowell, T.S., Kathman, R.D. and Hedrick, R.P.: Molecular phylogeny of oligochaete worms derived from mitochondrial DNA. Whirling Disease Symposium: Research in Progress, Fort Collins, CO. Feb. 19-21, pp. 137-139.
88. 1998 McDowell, T.S., Adkison, M.A., Andree, K.B., Marty, G.D. and Hedrick, R.P.: A comparison of antigenicity, genetic diversity and virulence of *Myxobolus cerebralis* from rainbow trout in Colorado, California and Montana. Whirling Disease Symposium: Research in Progress, Fort Collins, CO. Feb. 19-21, pp. 155-157.

89. 1998 Andree, K.B., Mukkatira, K., McDowell, T., MacConnell, E. and Hedrick, R.P.: Comparison of polymerase chain reaction (PCR) with existing detection methods for *Myxobolus cerebralis* in experimentally exposed rainbow trout (*Oncorhynchus mykiss*). Whirling Disease Symposium: Research in Progress, Fort Collins, CO. Feb. 19-21, 163-167.
90. 1998 Hedrick, R., Adkison, M., Georgiadis, M. and Watson, L.: Sturgeon viruses, impacts on aquaculture and recent appearances in Europe. Fourth International Symposium on Viruses of Lower Vertebrates, Weymouth, UK, May 12-15.
91. 1998 Mao, J-H., Hedrick, R.P., Green, D.E. and Chinchar, V.G.: Molecular characterization of newly-isolated iridoviruses from cold-blooded vertebrates. The Fourth International Symposium on Viruses of Lower Vertebrates, Weymouth, UK, May 12-15.
92. 1998 Hedrick, R.P.: Emerging Diseases of Fish. Third International Symposium on Aquatic Animal Health Proceedings, Baltimore, Maryland, Aug. 30 - Sept. 3, pp. 80-82.
93. 1998 Andree, K.B., Szekely, C., Molnar, K., El-Matbouli, M., McDowell, T.S. and Hedrick, R.P.: Application of ribosomal DNA Sequences to the Study of Myxosporean Parasites of the Genus *Myxobolus*. Third International Symposium on Aquatic Animal Health Proceedings, Baltimore, Maryland, Aug. 30 - Sept. 3, pp. 104.
94. 1998 Antonio, D.B., El-Matbouli, M., McDowell, T.S. and Hedrick, R.P.: Whirling Disease: Detection of Early Developmental Stages of *Myxobolus cerebralis* in Fish and Oligochaete Hosts by *In Situ* Hybridization. Third International Symposium on Aquatic Animal Health Proceedings, Baltimore, Maryland, Aug. 30 - Sept. 3, pp. 104.
95. 1998 El-Matbouli, M., McDowell, T.S. and Hedrick, R.P.: Laboratory Experiments on Some Exogenous Factors Influencing the Development of the Triactinomyxon Stages of *Myxobolus cerebralis*, the Causative Agent of Whirling Disease. Third International Symposium on Aquatic Animal Health Proceedings, Baltimore, Maryland, Aug. 30 - Sept. 3, pp. 105.
96. 1998 Beauchamp, K.A., McDowell, T.S., Kathman, R.D., Rasmussen, C., Colwell, A., Winton, J.R. and Hedrick, R.P.: Development of Molecular Markers to Identify Susceptible Oligochaete Hosts for *Myxobolus cerebralis*. Third International Symposium on Aquatic Animal Health Proceedings, Baltimore, Maryland, Aug. 30 - Sept. 3, pp. 105.

97. 1998 El-Matbouli, M., McDowell, T.S. and Hedrick, R.P.: Host Specificity of *Myxobolus cerebralis* Spores and Their Triactinomyxon Stage, the Causative Agent of Whirling Disease. Third International Symposium on Aquatic Animal Health Proceedings, Baltimore, Maryland, Aug. 30 - Sept. 3, pp. 106.
98. 1999
78. G.O. Kelley, M. El-Matbouli, M. Gay, T.S. McDowell, K.A. Beauchamp, K.B. Andree, R.P. Hedrick, and Barry Nehring : Actinosporeans detected in the upper Colorado River and Windy Gap Reservoir and their relationship to whirling disease. 5th Annual Whirling Disease Symposium, Research and Management Perspectives, Holiday Inn-Parkside, University of Montana, Missoula, Montana. February 18-20, 1999.
79. K.P. Andree, T.S. McDowell, M. El-Matbouli, G.D. Marty and R.P. Hedrick : Characterization of multiple myxosporean species in *Myxobolus cerebralis*-positive rainbow trout from California. Whirling Disease Symposium, Research and Management Perspectives, Holiday Inn-Parkside, University of Montana, Missoula, Montana. February 18-20, 1999.
80. Frederick T. Barrows, Alexander V. Zale, Thomas McMahon, and Ronald P. Hedrick : Development of a field collection method for the triactinomyxon stage of *Myxobolus cerebralis*. Whirling Disease Symposium, Research and Management Perspectives, Holiday Inn-Parkside, University of Montana, Missoula, Montana. February 18-20, 1999.
81. Gary D. Marty, Terry S. McDowell, Marios P. Georgiadis and Ronald P. Hedrick : Comparative susceptibility of rainbow trout and brown trout to experimental infections with *Myxobolus cerebralis*. Whirling Disease Symposium, Research and Management Perspectives, Holiday Inn-Parkside, University of Montana, Missoula, Montana. February 18-20, 1999.
82. M.A. Adkinson, P. Munoz, M. El-Matbouli, R.P. Hedrick, and Robert Olafson : Identification and preliminary characterizations of two serine proteases from the triactinomyxon of *Myxobolus cerebralis*. Whirling Disease Symposium, Research and Management Perspectives, Holiday Inn-Parkside, University of Montana, Missoula, Montana. February 18-20, 1999.
83. K.A. Beauchamp, T.S. McDowell, R.P. Hedrick and R.D. Kathman : Geographic population structure and species differences in the genus *Tubifex*. Whirling Disease Symposium, Research and Management Perspectives, Holiday Inn-Parkside, University of Montana, Missoula, Montana. February 18-20, 1999.
84. Melanie J. Gay, Mansour El-Matbouli, Katherine A. Beauchamp, Garry O. Kelley, Terry S. McDowell, Ronald P. Hedrick, R. Deedee Kathman, and R. Barry Nehring : Studies of oligochaetes from the Windy Gap Reservoir and the upper Colorado River, Colorado. Whirling Disease Symposium, Research and Management Perspectives, Holiday Inn-Parkside, University of Montana, Missoula, Montana. February 18-20, 1999.
85. D.B. Antonio, M. El-Matbouli and R.P. Hedrick : Identification of potential alternate host of *Myxobolus cerebralis* in wild tubificid oligochaetes by *in situ* hybridization. Whirling Disease Symposium, Research and Management Perspectives, Holiday Inn-Parkside, University of Montana, Missoula, Montana. February 18-20, 1999.
86. Mansour El-Matbouli, Melanie Gay, Terry S. McDowell, Marios P. Georgiadis, and Ronald P. Hedrick : The potential for using biological control technologies in the management of whirling disease. Whirling Disease Symposium, Research and Management Perspectives, Holiday Inn-Parkside, University of Montana, Missoula, Montana. February 18-20, 1999.
87. T.S. McDowell, R.P. Hedrick, G.D. Marty, K. Mukkatira, and K.B. Andree. 2000. Ultraviolet irradiation

with the cyrptosporidium inactivation device as a treatment for for hatchery water supplies to prevent infections with *Myxobolus cerebralis*. 6th Annual Whirling Disease Symposium. Coeur d'Alene, Idaho. February 3 - 4, 2000.

88. K.B. Andree, M. Quinn, J. Moran, E. MacConnell, T.S. McDowell, and R.P. Hedrick. 2000. Practical applications of recently developed DNA-based detection assays for *Myxobolus cerebralis*. 6th Annual Whirling Disease Symposium. Coeur d'Alene, Idaho. February 3 - 4, 2000.
89. M. El-Matbouli, M. Adkison, T.S. McDowell, and R.P. Hedrick. 2000. Fish host specificity of the triactinomyxon spores of *Myxobolus cerebralis*. 6th Annual Whirling Disease Symposium. Coeur d'Alene, Idaho. February 3 - 4, 2000.
90. M.A. Adkison, R.P. Hedrick and M. El-Matbouli. 2000. Light and electron microscopic analysis of the early infection of susceptible and resistant salmonid species and immune and naive rainbow trout with *Myxobolus cerebralis*. 6th Annual Whirling Disease Symposium. Coeur d'Alene, Idaho. February 3 - 4, 2000.
91. B. P. Shum, L. L. Flodin, M.A. Adkison, R.P. Hedrick, B. Nehring, and P. Parham. 2000. Major histocompatibility complex class I and class II genes in rainbow trout and brown trout. 6th Annual Whirling Disease Symposium. Coeur d'Alene, Idaho. February 3 - 4, 2000.
92. K.A. Beauchamp, D. Kathman, T.S. McDowell, and R.P. Hedrick. 2000. Mitochondrial DNA variation reveals genetically distinct lineages of the susceptible oligochaete host for *Myxobolus cerebralis*. 6th Annual Whirling Disease Symposium. Coeur d'Alene, Idaho. February 3 - 4, 2000.
93. G.O. Kelley, M. Gay, M. El-Matbouli, K.A. Beauchamp, and R.P. Hedrick. 2000. Use of genetic markers to study susceptible and non-susceptible oligochaetes in whirling disease enzootic areas: Windy Gap reservoir and upper Colorado River. 6th Annual Whirling Disease Symposium. Coeur d'Alene, Idaho. February 3 - 4, 2000.
94. K.A. Beauchamp, R.D. Kathman, T.S. McDowell, and R.P. Hedrick. 2000. Molecular phylogeny of tubificid oligochaetes with special emphasis on *Tubifex tubifex* as the host to the fish parasite *Myxobolus cerebralis*. VIII International Symposium on Aquatic Oligochaeta. University of Basque Country, Spain. July 18 - 22, 2000.
95. O. Gilad, S. Yun, K. Andree, M. Adkison, A. Zlotkin, H. Bercovier, A. Eldar. 2000. Characteristics of a herpesvirus associated with mass mortality among koi and common carp and development of a PCR assay for detecting the virus. 23rd Annual Meeting of the AFS/Fish Health Section, Pensacola Beach, Florida, September 6 - 8, 2000.
96. R.P. Hedrick, M.F. Chen, S. Yun, G.D. Marty, T.S. McDowell, M.L. House, and K.D. Arkush. 2000. A *Piscirickettsia salmonis*-like bacterium associated with mortality of white seabass *Atractocion nobilis*. 23rd Annual Meeting of the AFS/Fish Health Section, Pensacola Beach, Florida, September 6 - 8, 2000.
97. M. Quinn, K.B. Andree, E. MacConnell, T.S. McDowell, and R.P. Hedrick. 2000. Practical applications of newly developed DNA-based detection assays for *Myxobolus cerebralis*. 23rd Annual Meeting of the AFS/Fish Health Section, Pensacola Beach, Florida, September 6 - 8, 2000.
98. R.P. Hedrick, B. Okamura, S.W. Feist, and M. Longshaw. 2000. PKD: Etiology, Biology and Diagnosis. Italian Society of Fish Pathologists. Bologna, Italy September 25 - 27, 2000.
99. R.P. Hedrick, M. El-Matbouli. 2001. Taxonomic, life cycle, and developmental characteristics of *Myxobolus cerebralis* in the fish and oligochaete hosts. 7th Annual Whirling Disease Symposium, Salt Lake City, Utah, February 8 - 9, 2001.
100. M.A. Adkison, R.W. Olafson, R.P. Hedrick. 2001. Purification of the serine protease from the triactinomyxon stage of *Myxobolus cerebralis*. 7th Annual Whirling Disease Symposium, Salt Lake City,

- Utah, February 8 - 9, 2001.
101. Andree, K.B., Hedrick, R.P. 2001. Investigations in the mechanisms of *Myxobolus cerebralis* using subtractive hybridization. 7th Annual Whirling Disease Symposium, Salt Lake City, Utah, February 8 - 9, 2001.
 102. Kelley, G.O., K.B. Andree, R.P. Hedrick. 2001. Proteolytic enzymes from *Myxobolus cerebralis*: isolation of sequence homologs and their potential role in the pathogenesis of the disease. 7th Annual Whirling Disease Symposium, Salt Lake City, Utah, February 8 - 9, 2001.
 103. Shum, B.P., L.R. Flodin, R.B. Nehring, M.A. Adkison, R.P. Hedrick, P. Parham. Correlation of MHC allotypes with whirling disease susceptibility. 7th Annual Whirling Disease Symposium, Salt Lake City, Utah, February 8 - 9, 2001.
 104. Beauchamp, K.A., G.O. Kelley, M. Gay, M. El-Matbouli, R.D. Kathman, R.B. Nehring, R.P. Hedrick. Susceptibility of infection to *Myxobolus cerebralis* and genetic differences among populations of *Tubifex tubifex* from the Upper Colorado River. 7th Annual Whirling Disease Symposium, Salt Lake City, Utah, February 8 - 9, 2001.
 105. Rasmussen, C., A.E. Colwell, J.R. Winton, R.I. Stevens, B.L. Kerans, R.D. Kathman, T.S. McDowell, R.P. Hedrick, K.A. Beauchamp. 2001. *Tubifex tubifex* phylogeny I: A comparative approach with management implications. 7th Annual Whirling Disease Symposium, Salt Lake City, Utah, February 8 - 9, 2001.
 106. Beauchamp, K.A., A.E. Colwell, J.R. Winton, R.I. Stevens, B.L. Kerans, R.D. Kathman, T.S. McDowell, R.P. Hedrick, C. Rasmussen. 2001. *Tubifex tubifex* phylogeny II: A comparative approach with management implications. 7th Annual Whirling Disease Symposium, Salt Lake City, Utah, February 8 - 9, 2001.
 107. Arkush, K.D., T.S. McDowell, A. McBride, H.L. Mendonca, G.D. Marty. 2001. Effects of *Myxobolus cerebralis* on survival of chinook salmon in seawater. 7th Annual Whirling Disease Symposium, Salt Lake City, Utah, February 8 - 9, 2001.
 108. Hedrick, R.P., S.E. LaPatra. 2001. Characteristics of viral diseases of sturgeon and their impacts on aquaculture, conservation, and international trade. 4th International Symposium on Sturgeon, Oshkosh, Wisconsin. July 8 - 13, 2001.

* = publication included in the dossier

x = most significant works

+ = student/resident/postdoctoral trainee where faculty member played major mentoring role

GRANTS AND AWARDS:

1. United States Department of Agriculture, Development and Utilization of a Cell Line from White Sturgeon (*Acipenser transmontanus*). Grant No. 82-CRSR-2-2106 8/82 - 7/84. \$28,128.
2. National Science Foundation, Control of Infectious disease among Cultured Fishes in Taiwan. INT-820-7426. 7/80 - 6/82. \$15,334.
3. Ecological Analysts. Bacterial Flora Found in Refinery Wastewaters. 6/83 - 5/84. \$3,012.
4. Sea Grant. Detection of the Infectious Stage of the Parasite Causing Proliferative Kidney Disease in Pacific Salmon. 4/84 - 10/84. \$4,579.
5. Sea Grant. Parameters Critical to White Sturgeon. Grant No. R/F-90. 10/83 - 9/85. \$35,000.
6. Sea Grant. Evaluation of the Protective Antigens of *Aeromonas salmonicida*. Grant No. R/A-58. 10/83 - 9/85. \$53,228.

7. Eli Whitney Funds. The Pathology, Life Cycle and Control of Eimeria carpelli: The cause of chronic mortalities in cultured goldfish. Grant No. 3-407235. 1/83 - 12/84. \$5,900.
8. Sea Grant. Marine Advisory Program, Diagnostic Lab. Grant No. A/AE-1B. 10/84 - 9/85. \$6,000.
9. Sea Grant. Kidney Diseases of Pacific Salmon. Grant No. R/F-100. 10/84 - 9/87. \$69,775.
10. United States Department of Agriculture. Proliferative Kidney Disease of Salmonid Fish. Grant No. CRSR-8501413. 8/85 - 7/87. \$70,030.
11. Catfish Farmers of America. Investigations of Channel Catfish Virus Envelope Proteins. 7/84 - 12/85. \$3,600.
12. Aquaculture and Fisheries Program. Relationship of Two Salmonid Myxosporidians. 7/85 - 7/86. \$3,000.
13. California Department of Fish and Game. Proliferative Kidney Disease in California Salmonids. 10/86 - 11/88. \$247,129.
14. California Department of Fish and Game. Whirling Disease in California Salmonids. 10/86 - 11/87. \$80,500.
15. National Science Foundation. Control of Infectious Diseases of Cultured Fish in Taiwan. Grant No. INT-8501905. 10/85 - 3/88. \$18,666.
16. U.S.D.A. Rapid Detection of Viral Diseases of Salmonid Fish. 6/86 - 5/89. \$77,970. Co-investigator with Dr. J.R. Winton, Oregon State University.
17. National Science Foundation. Infectious Bacterial and Viral Diseases Among Populations of Fish in Korea. Grant No. INT 8410350. 7/84 - 6/87 \$13,850. Co-investigator with Dr. J.L. Fryer, Oregon State University.
18. California Department of Fish and Game. Infectious Hematopoietic Necrosis Virus (IHNV) of Salmonid Fish. 7/87 - 6/90 \$233,155.
19. California Department of Fish and Game. Whirling Disease of Salmonid Fish in California. 7/88 - 6/90. \$153,700.
20. U.S.D.A. Infectious Hematopoietic Necrosis Virus. 1/88 - 12/90 \$115,000.
21. California Department of Fish and Game. Edwardsiella ictatari of Channel Catfish. 7/88 - 6/90. \$180,000.
22. California Sea Grant College. Nocardiosis of Pacific Oysters. 10/88 - 9/90. \$42,000.
23. Abbott Laboratories. Laboratory Evaluation of Feed Efficacy of A56620 Against Bacterial Pathogens in Rainbow Trout. 1/89 - 12/89. \$110,585.
24. Chinoin Inc. Studies on Toxicity and Efficacy of Fumagillin DCH. 1/89 - 12/89. \$60,000.
25. U.S.A.I.D. Kidney Disease of Sea Bass in Thailand. 7/88 - 6/90. \$27,000.
26. Bonneville Power Authority. Whirling Disease of Spring Chinook Salmon. 6/90 - 5/95. \$510,000 (pending).
27. California Department of Fish and Game. Whirling Disease of Salmonid Fish in California. 7/90 - 6/92.

\$153,700.

28. California Department of Fish and Game. Edwardsiella ictaluri Infections of Sport Fish in California. 7/90 - 6/92. \$141,400.
29. Abbott Laboratories. Dose Titrations with Sarafloxacin against Edwardsiella ictaluri infections in channel catfish. 4/90 - 3/91. \$45,000.
30. California Sea Grant College. Abalone Wasting Disease; Role of Coccidian Parasites and Environmental Factors. 10/90 - 9/93. \$90,000.
31. California Department of Fish and Game. Sturgeon iridovirus. 7/90 - 6/92. \$177,000.
32. U.S.D.A. Western Region Aquacultural Consortium. Control of Infectious Hematopoietic Necrosis Virus. 4/90 - 3/95. \$165,000. 1 of 5 PIs.
33. U.S.D.A. Western Region Aquacultural Consortium. Control of Infectious Hematopoietic Necrosis Virus. 4/95 - 3/00. \$165,000. 1 of 5 PIs.
34. U.S.D.A. Formula Funds. Identification of lymphoid cell populations in rainbow trout. 10/90 - 9/91. \$7,000.
34. California Department of Fish and Game. Fish Disease Research. 7/93 - 6/96. \$315,000.
35. California Sea Grant. White sturgeon iridovirus. 10/92 - 9/95. \$110,000 (includes Trainee stipend).
36. U.S.D.A. NRI Enterocytozoon salmonis infections in salmonid fish. 10/93 - 9/95. \$120,000.
37. NMFS, USFWS, DWR, Cal. Dept. Fish and Game. Winter run chinook broodstock. 10/92 - 9/02. \$5,000,000 (all building, staff, supplies at the Bodega Marine Laboratory, Bodega Bay, CA) .
38. California Department of Water Resources. Detection of Mycobacterium spp. in Delta smelt. 8/15/93 - 7/14/95. \$40,700.
39. Federal Aid. Development of a DNA based test for the detection of Myxobolus cerebralis, the cause of whirling disease 10/95 - 9/97. \$127,000.
40. Bonneville Power Authority. Susceptibility of bull trout and west slope cutthroat trout to Myxobolus cerebralis. 10/95 - 9/96. \$21,750.
41. Federal Aid. Investigation of role of rickettsiales-like procaryotes and withering syndrome of black abalone: Koch's postulates and molecular probes. 6/97-11/98. \$192,139.
42. U.S.F.W.S. Control of whirling disease. 2/97 – 1/00. \$450,000.
43. U.S.F.W.S. Application of new DNA-based tests for Myxobolus cerebralis in the field. 9/98 – 8/99. \$86,500.
44. Cal. Dept. Fish and Game. Statewide Fish Disease Research. 7/96 – 6/99. \$225,000
45. Cal. Dept. Fish and Game. White seabass rickettsiosis. 1/99 – 12/00. \$43,000.
46. U.S.F.W.S. Iridovirus Infections in Sturgeon. 9/99 – 8/01. \$98,500

47. California Sea Grant. Control of rickettsial infections in white seabass. R/A-114. 3/00 – 2/02. \$125,000.
48. Whirling Disease Foundation. Comparative salmonid susceptibility to whirling disease. 1/99 – 12/04. \$375,000.
49. U.S. –Israel. BARD. Control of a new herpesvirus in koi and common carp. 10/00 – 10/03. \$297,000.
50. U.S.D.A. WRAC. 4/00 – 4/003. Sturgeon broodstock development. With 4 other Pi's. Fish health component \$60,000
51. Cal. Dept. Fish and Game. Statewide Fish Disease Research. 7/00 – 6/30/03. \$225,000.
52. Cal. Dept. Fish and Game. Viral Testing. 7/00 – 6/30/03. \$146,000.
53. Cal. Dept. Fish and Game. Detection methods for the agent causing withering syndrome in abalone. 7/00 – 6/30/01. \$93,500.
54. U.S.G.S. Approaches to the Control of Whirling Disease. 10/00 – 10/03. \$450,000.
55. Cal. Dept. Fish and Game. Detection of the rickettsial agent causing withering syndrome in abalone. 7/1/00 - 6/30/01. \$99,000.
56. Cal. Dept. Fish and Game. Viral and bacterial testing of white seabass. 7/01 - 6/02. \$37,500.
57. Whirling Disease Foundation. Characterization of the genetic resistance of German rainbow trout to whirling disease. 4/1/01 - 5/1/02. \$175,000. Co-PI with Dr. El-Matbouli at Munich University.

REFERENCES

1. Dr. John L. Fryer PhD, Professor Emeritus, Department of Microbiology, Oregon State University, Corvallis, Oregon 97331. 541/757-4753.
2. Dr. Frank M. Hetrick PhD, Professor Emeritus, Department of Microbiology, University of Maryland, College Park, Maryland 20742. 301/454-5411.
3. Dr. Bruce L. Nicholson PhD, Professor and Chairman, Department of Microbiology, University of Maine, Orono, Maine 04473. 207/581-6728.
4. Dr. Takahisa Kimura PhD, Professor Emeritus, Faculty of Fisheries, Hokkaido University, Hakodate, Japan.
5. Dr. Jo-Ann C. Leong PhD, Professor and Chairman, Department of Microbiology, Oregon State University, Corvallis, Oregon 97331. 541/757-4441.
6. Dr. Barry Hill PhD, Fish Disease Laboratory, Ministry of Agriculture, Fisheries and Food, The Nothe, Weymouth, Dorset, DT4 8UB, England
7. Dr. James R. Winton PhD, Fish Health Unit, U.S. Geological Survey, Western Fisheries Research Center, Seattle, WA 98115-5007
8. Dr. Hugh W. Ferguson BVM&S, PhD, DipACVP, MRCVS, FRCPath, Professor of Diagnostic Pathology & Microbiology, Veterinary Diagnostic Service, Institute of Aquaculture, University of Stirling, Scotland FK9 4LA.
9. Dr. Hans-Jurgen Schlotfeldt DVM, President, European Association of Fish Pathologists, State Fish Epizootics Control Service of Lower Saxony, Eintrachtweg 17D-30173 Hannover, Germany.
10. Dr. Tom Baldwin DVM, PhD, Associate Professor, Dept. of Veterinary Microbiology and Pathology, Washington State University, Pullman, WA 99164-7040

GRADUATE STUDENTS

Jeffrey Speas	M.S.	1985
Michael Kent	Ph.D.	1985
William Eaton	Ph.D.	1988
William Cox	Ph.D.	1990
Scott Foott	Ph.D.	1989
Melody Jensen	Ph.D.	1989
Carolyn Friedman	Ph.D.	1990
Scott La Patra	Ph.D.	1989 (Student of Dr. J.L. Fryer)
Kristen Arkush	Ph.D.	1993
Joseph Groff	Ph.D.	1987 - 1993
Lynn Watson	Ph.D.	1997
Diego Fridman	Ph.D.	1996 (co-advisor with Dr. J. Zinkl)
Ana Ibarra	Ph.D.	1992 (co-advisor with Dr. G. Gall)
Johannes Kismomhandaka	Ph.D.	Left program after 3 yrs
Janeju Wongtavactai	Ph.D.	1994
Patrick Foley	Ph.D.	Terminated after 5 yrs
Chin Chuen Lee	Ph.D.	1998
Karl Andree	PhD	1997
Sara Crawford	MPVM	1995

Xiuyan Chen	MPVM	1/94 - 2/96
Marios Genigiordas	MPVM	1995 (qualitative advisor)
Marios Genigiordas	PhD	1999 (co-advisor with Dr. I. Gardner)
Chris Wilson	MS	1998
Molly Most	MPVM	1996
Ben Sun	MPVM	1997
Garry Kelley	Ph.D.	2002
Kevin Kwak	MS	in progress
Oren Gilad	Ph.D.	2002
Stephane Gresoviac (coadvisor with Dr. Vivares – France)	Ph.D.	2000
Beverly Braid	MS.	in progress (co-advisor with Dr. C. Friedman)
Jennifer Jeung	Ph.D.	in progress
Mark Clifford	Ph.D.	in progress
Christin Ambendorf	Ph.D.	in progress

RESIDENTS

Dr. Jill Spangenberg	1/1/97 – present
Dr. Tom Sholseth	7/1/97 – 6/30/98

VISITING SCHOLARS

Paul Bakwel, Wageningen Agricultural University, Wageninengen, Netherlands	3/88 - 9/88
Dr. J. Dominguez, INIA, Madrid, Spain	5/89 - 6/89
Dr. Stefan Chilmonczyk, INRA, Jouy en Josas, France	3/91 - 6/91
Dr. Alexandra Adams, Institute of Aquaculture, Stirling, Scotland	2/92 - 3/92
Mercedes Marin de Mateo, Madrid, Spain	1/92 - 9 /92
Dr. Bernardo Basurco, INIA, Madrid, Spain	10/90 - 2/92
Nancy Roojakkars, Wageningen Agricultural University, Wageninengen, Netherlands	4/93 - 12/93
Dr. Alessandra Milani, Perugia School of Veterinary Medicine, Italy	2/93 – 6/97
Dr. Claudio Ghittino, Istituto Zooprofilattico, Torino, Italy	7/93 - 8/93
Dr. Pierre de Kinkelin, INRA, Jouy en Josas, France	7/93 - 8/93
Dr. Claudio Ghittino, Int. Zooprof., Torino, Italy	3/95, 2/98
Dr. Guiseppe Bovo, Int. Zooprof., Padova, Italy	6/95
Dr. Christian Michel, INRA, Jouy en Josas, France	6/95 - 6/96
Dr. Mansour El-Matbouli, Munich University	8/97 – 8/99
Ms. Melanie Gay, Montpellier University	8/96 – 6/99
Dr. Jon Moran, Postdoctoral Fellow	9/99 – 7/02
Dr. Katie Beauchamp, Postdoctoral Fellow	1/98 – 12/02

